AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1. **(currently amended)** A photodiode comprising,

~~(a)~~ first ohmic contact layer;

~~(b)~~ a semiconductor structure comprising ~~consisting~~ of;

- ~~(i)~~ a semiconductor substrate;
- ~~(ii)~~ a highly doped buffer layer, material-type same as the substrate;
- ~~(iii)~~ a single or multiple layers of InGaAs with different compositions of In, Ga, and As without containing of Al for absorption layer;
- ~~(iv)~~ a doped-thin layer of InGaAs, and;
- ~~(v)~~ a highly doped-thick layer of InGaAs for second ohmic contact, wherein a window is created for incident light to reach the thin layers and wherein window is in u-shape or horse-shoe shape, and;

~~(c)~~ a second ohmic metal contact on the top of the doped-thick layer.

2. **(currently amended)** The photodiode array comprises:

~~(a)~~ NxN photodiodes, wherein each photodiode comprises,

- ~~(i)~~ common ohmic metal contact layer on the backside of the semiconductor substrate for all photodiodes in the array;
- ~~(ii)~~ the said semiconductor structure as claimed in claim 1, and;

~~(iii)~~ the said second ohmic-contact layer on the top of the highly doped-thick InGaAs layer as claimed in claim 1, and;

~~(b)~~ monolithically fabricated interconnection metal line, wherein each metal line is connecting each photodiode to the outside pad, and each photodiode is independently addressable, and;

an antireflection coating (AR) layer,

wherein surrounding region of each photodiode in the said array is etch out to at least portion of the said absorption layer and wherein the light is incident from the top of the photodiode.

3. **(previously withdrawn-currently amended)** The said interconnection metal lines as claimed in Claim 2, connects the photodiodes in a way that at a time only one photodiode signal can be taken out located in the same row and column.

4. **(previously withdrawn-currently amended)** The said interconnection metal lines, as claimed in Claim 2, can be designed in a way that metal connection of each photodiode located inside one-fourth of the array are designed to align in two sides, and replica of this metal layout can be copied for metal connection alignment for other photodiodes located inside the three-fourth of the array.

5. **(currently amended)** The photodiode array comprises:

~~(a)~~ NxN photodiodes, wherein each photodiode comprises,

an antireflective coating (AR);

~~(i)~~ a common ohmic contact layer;

~~(ii)~~ a etch-off semiconductor substrate to open for incident light;

~~(iii)~~ the said semiconductor structure as claimed in claim 1; and;

~~(iv)~~ the said second ohmic metal contact layer, as claimed in Claim 1, on the top of the said highly doped-thick InGaAs layer ~~as claimed in claim 1;~~

wherein a common ohmic contact connecting directly to the substrate, can be made by opening thru-hole from the front side of the substrate to make compatible for flip-chip bonding

6. **(previously withdrawn-currently amended)** The said highly doped-thin layer of InGaAs, as claimed in Claim 1, is on the light incident surface for the top-incident type photodiode.

7. **(previously withdrawn-currently amended)** The said highly doped-thick layer of InGaAs, as claimed in Claim 1, could be single high-doped InAlAs material or highly doped multiple layers of InAlAs and InGaAs.

8. **(previously withdrawn-currently amended)** ~~In the case of~~ The said single high-doped InAlAs layer or said multiple ~~(combination)~~ high-doped InAlAs and high-doped InGaAs layers, as claimed in claim 7, could be the graded layer incorporated in the structure to reduce the resistance at the InAlAs-InGaAs band-edge discontinuity.

9. **(previously withdrawn-currently amended)** The said substrate type as claimed in claim~~s~~ 1, is InP, ~~or~~ InGaAs, or GaAs.

10. **(previously withdrawn-currently amended)** The highly doped-thin InGaAs layer and highly doped-thick InGaAs layer, as claimed in Claim 1, can have the same or different level of doping.

11. **(previously withdrawn)** The fabrication process of the photodiode array of top-incident type, comprises,

(a) growing the layers forming the photodiode structure on the said substrate as claimed in claim 1;

(b) patterning and dry etching of highly doped thick layer of InGaAs, as claim in Claim 1, to open the incident surface;

(c) formation of the top ohmic contact;

(d) patterning and dry-etching the diode structure to isolate from each other;

(e) depositing the step coverage layer and planarization;

(f) patterning and formation metal lines connecting the photodiode contact to the outside pad;

(g) etch out the dielectric from the incident surface;

(h) polishing the substrate and formation of the common ohmic contact at the back side of the substrate, and;

(i) formation of antireflection coating on the top of the surface.

12. **(previously withdrawn-currently amended)** The metal lines, as claimed in Claim ~~11~~ 2, can be made using the molding ~~(~~ like nano ~~and~~ or micro ~~–~~scaled level imprinting ~~)~~

13. **(previously withdrawn)** The fabrication process of the photodiode array of bottom-incident type, comprises,

(a) growing the layers forming the photodiode structure on the said substrate as claimed in claim 1;

(b) patterning and formation of the top ohmic contact;

(c) patterning and dry-etching the diode structure to isolate from each other;

(d) depositing the step coverage layer and planarization;

(e) formation of the common ohmic contact at the back side of the substrate;

(f) etching-off back side of the substrate to open the incident light surface, and;

(g) formation of antireflection coating on the bottom light incident surface.

14. **(currently amended)** The AR coating as claimed in claim ~~11~~ 2 is single layer or multiple layers of metal oxides.

15. **(previously withdrawn)** The dry etching for isolating each photodiode element from each other, as claimed in claim 11 is needed to etch out down to the intrinsic absorption layer or more bellower than that.

16. **(previously withdrawn)** The dry etching for isolating photodiode element from each other as claimed in claim 11 is needed to be etch out down to the surface of the said substrate or below than its surface.

17. **(currently amended)** At least one ~~The fixed or~~ tunable filter can be monolithically integrated on the said photodiode, as claimed in Claim 1, to tune the wavelength as necessary.

18. **(previously withdrawn)** The fabrication process of single photodiode of top-incident type, comprises,

(a) growing the layers forming the photodiode structure on the substrate as claimed in claim 1;

(b) patterning and dry etching of highly doped thick layer of InGaAs, as claim in Claim 1, to open the incident surface;

(c) formation of the top ohmic contact;

(d) polishing the substrate to appropriate thickness and formation of the bottom ohmic contact, and;

(e) formation antireflection coating on the top of the surface.

19. **(previously withdrawn)** The fabrication process of the single photodiode of bottom-incident type, comprises,

(a) growing the layers forming the photodiode structure on the said substrate as claimed in claim 1;

(b) patterning and formation of the top ohmic contact;

(c) formation of the common ohmic contact at the back side of the substrate;

(d) etching-off back side of the substrate to open the incident light surface, and;

(f) formation of antireflection coating on the bottom light incident surface.

20. **(currently amended)** At least one ~~Single~~ tunable filter ~~or combination of the fixed filters~~ can be integrated with the photodiode array, as claimed in claim ~~19~~ 2 to filter the wavelengths spatially along the arrays.

21 **(new)** A photodiode comprising,

first ohmic contact layer;

a semiconductor structure comprising of;

a semiconductor substrate;
a highly doped buffer layer, material-type same as the substrate;
at least one layer of InGaAs with different compositions of In, Ga, and As without containing of Al for absorption layer;
a doped-thin layer of InGaAs, and;
a highly doped-thick layer of InGaAs for second ohmic contact, wherein a window is created for the incident light to reach to the InGaAs thin layer and wherin the said window is in square-shape, or rectangular-shape, or circular-shape, and;

a second ohmic metal contact on the top of the said doped-thick layer.